

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: JEONG, Seung-Hoon

SERIAL NO.: 10/575351

ART UNIT: 3744

FILED: 11 April 2006

EXAMINER:

TITLE: AUTO-REGENERABLE HOT AND COLD WATER SOFTENER

Supplemental Preliminary Amendment: CLAIM AMENDMENTS

1. (Currently amended) An automatic regenerable cold/hot water softener comprising:

a water softening tank being comprised of at least two softening water regions formed along a vertical direction of length of the water softening tank to partition radially an inside of a cylindrical body, water softening regions being filled with ion exchange resin, a valve region formed in an upper end of the water softening tank, joining the water softening regions to each other, and a water outlet region formed in a lower end of the water softening tank, joining the water softening regions;

a regenerating tank being filled with regenerating substance, the regenerating tank having a regenerating tank stopper for opening an inside thereof;

a raw water supply pipe supplying raw water to a valve region, a regenerating raw water pipe and a regenerating water pipe connected to the upper end of and the lower end of the regenerating tank, respectively, and a direct water pipe for connecting the valve region and the water outlet region;

a temperature sensor, sensing temperature of the raw water and a flow meter for finding a cumulative total of a supply amount of the raw water;

a switching valve built in the valve region, supplying raw water to one region selected

from the water softening regions in a water softening mode, inducing raw water into the regenerating raw water pipe and then supplying regenerating water collected from the regenerating water pipe to each of the water softening regions in a regeneration mode, inducing raw water into the direct water pipe in a direct water mode, and shutting off the raw water supply pipe in an intermittent mode;

a valve driving part, controlling operation of the switching valve; and

a control part, distributing the raw water into each of the water softening regions according to temperature in the water softening mode based on the measured result of the temperature sensor, and controlling the valve driving part to change the intermittence mode into the regeneration mode based on the cumulative result of the flow meter.

2. (Previously amended) A cold/hot water softener according to the claim 1, wherein the water softener further comprises:

a pre-processing filter is installed in the raw water supply pipe in a deposition method for filtering the raw water or an adsorption method using activated carbon.

3. (Previously amended) A cold/hot water softener according to the claim 1, wherein the switching valve comprises:

a static disk fixed to close an upper end of each of the water softening regions, the static disk exposing soft water holes and regenerating water distribution holes communicated with the water softening regions, respectively, a regenerating raw water hole in communication with the regenerating raw water pipe, a regenerating water hole in communication with the regenerating water pipe, a direct water hole in communication with the direct water pipe, and a closed hole, on an upper surface thereof; and

a rotary disk staked on the static disk, the rotary disk being rotated about a center axis

projected upwardly, whereby, as the rotary disk is rotated, the rotary disk has a connecting opening for exposing one hole selected from soft water holes to the valve region in the water softening mode, exposing the regenerating raw water hole being comprised of a plurality of fine holes to the valve region, and, simultaneously, interconnecting the regenerating water hole and the regenerating water distribution holes by trap groove in the regeneration mode, exposing the direct water hole to the valve region in the direct water mode, and exposing the closed hole to the valve region in the intermittence mode.

4. (Currently amended) A cold/hot water softener according to the claim 3, wherein the regenerating water hole is positioned eccentrically from the center of the static disk, the regenerating water distribution holes having a same inner pressure as the soft water holes, respectively, and being arranged along edges of the regenerating water hole, each of the soft water holes, the direct water hole, the regenerating raw water hole and the closed hole being arranged radically in turn along the edges of the static disk of the outside of the regenerating water hole and the regenerating water distribution hole and being maintained in equal distances from the center of the fixing static disk.

5. (Currently amended) A cold/hot water softener according to the claim 1, wherein the raw water supply pipe is connected to ~~the~~ a side of the valve region, wherein the regenerating water pipe is extended from the lower end of the regenerating tank and then is passed through the side of the lower end of the regenerating tank and then is connected to the rear surface of the static disk while built along the direction of length, and wherein the direct water pipe is extended from the rear surface of the static disk and then is connected to the water outlet region while built in along the direction of length of the regenerating tank.

6. (Previously amended) A cold/hot water softener according to the claim 5, wherein the

water softener further comprises:

an enlarged groove for each upper end of the soft water holes to be adjacent to neighboring soft water holes.

7. (Previously amended) A cold/hot water softener according to the claim 1, wherein the valve driving part comprises:

a power means having a rotation shaft;

a motor gear fixed to the rotation shaft with a center thereof being penetrated by the rotation shaft;

a main gear engaged with the motor gear with a center thereof being penetrated and fixed by the center axis of the rotary disk; and

a position plate having numerous discrimination marks along edge thereof, a center of the position plate being penetrated by the center axis of the rotary disk.

8. (Previously amended) A cold/hot water softener according to the claim 1, wherein the control part comprises:

a position detecting sensor for finding a degree of rotation of the rotary disk by sensing discrimination marks; and

a logical operation device, controlling rotating direction and angle of the rotation shaft based on the position sensor, the temperature sensor and the flow meter.

9. (Currently amended) A cold/hot water softener according to the claim 1, wherein the water softener further comprises:

an agitating means installed within the regenerating tank;

a water level detecting sensor for sensing a level of the regenerating water within the

regenerating tank; and

a discharging valve ~~which is being~~ installed passing through the bottom surface of the regenerating tank and ~~which is being~~ opened and closed by the water lever detecting sensor to constantly maintain the level of the regenerating water.

10. (Currently amended) An automatic regenerable cold/hot water softener comprising:

a tank part being comprised of a pre-processing filter tank having filter substance therein, the filter tank having an water inlet into which the cold/hot raw water is supplied, cold/hot water softening tanks in which ion exchange resins are filled, the water softening tanks having cold/hot soft water outlets, respectively, and a regenerating tank having a regenerating substance therein, the regenerating tank having a regenerating water discharging hole, each of the tanks having an opened upper side;

a base plate for covering an upper side of the tank part while securing a valve region having a direct water discharging hole and a regenerating water supply hole connected to the regenerating water discharging hole, the base plate having a raw water supply hole communicated with the pre-processing filter tank, a regenerating tank inlet and a regenerating raw water discharging hole which are communicated with the regenerating tank, cold/hot raw discharging holes communicated with the cold/hot water softening tanks, respectively, and a regenerating water supply hole connected to the regenerating water discharging hole;

a valve housing having a ball shape, the valve housing being formed with cold/hot raw water holes, a regenerating raw water hole, a regenerating water hole communicated with the regenerating water supply hole, and a direct water hole connected with the direct water discharging hole, at a bottom side thereof joined on the valve region;

a regenerating tank stopper for closing the regenerating tank inlet, and a pre-processing filter tank stopper for closing a pre-processing filter tank inlet surrounding an edge of the raw water supply hole;

a supply passage for connecting the pre-processing filter tank inlet with a side surface of the valve housing, a cold/hot raw water passages for connecting the cold/hot raw water holes with the cold/hot raw water discharging holes, respectively, and a regenerating raw water passage for connecting the regenerating raw water hole with the regenerating raw water discharging hole; and

a switching valve assembly, inducing raw water supplied through the supply passage into the direct water hole in the water direct discharging mode, inducing the raw water supplied through the supply passage into the cold/hot raw water holes in the cold/hot water softening mode, and inducing the raw water into the regenerating raw water hole and then inducing the regenerating water supplied to the regenerating water supply hole into the cold/hot raw water holes in the regeneration mode.

11. (Currently amended) A cold/hot water softener according to claim 10, wherein the switching valve assembly comprises:

a static disk having an inner diameter smaller than a bottom surface of the assembly, the static disk being fixed on the bottom surface, the static disk being formed with a regenerating water hole, a cold/hot raw water holes communicated with the cold/hot raw water holes, respectively, a direct water hole communicated with the direct water hole, and a regenerating raw water hole communicated with the regenerating water hole, at a central portion thereof, the static disk being formed with a cold regenerating water inflow groove induced from the cold raw water hole to a center thereof at a predetermined length;

a rotary disk stacked on the static disk, the rotary disk being rotated on the static disk;
a cover disk stacked on the rotary disk, the cover disk being rotated together with the
rotary disk; and

a valve cover for closing the switching valve housing in the upper part of the rotary
disk;

wherein, according to rotation, the rotary disk opens each of the cold/hot raw water holes in
the cold/hot water softening mode, the rotary disk opening a direct water hole in the water direct
discharging mode and opening a regenerating raw water hole in the regeneration mode,

wherein, the rotary disk is formed with an opening and closing hole induced from one side
thereof, a trap groove formed therewithin for opening the regenerating water hole, and cold/hot
regenerating water distribution grooves branched off from the trap groove and connected with the
cold regenerating water hole inflow groove and the hot raw water hole in the regeneration mode,
respectively, on a bottom surface thereof.

12. (Currently amended) An automatic regenerable cold/hot water softener comprising:

a pre-processing filter tank having a water inlet provided with a flow meter and a
temperature sensor;

a water softening tank being comprised of a cold water softening part having the ion
exchange resin therein and a cold soft water outlet, and a hot water softening part divided by at least
two regions for softening raw water having different temperature, the regions having hot soft water
outlets, respectively;

a regenerating tank having the regenerating substance therein and a regenerating water
discharging hole;

a first switching valve, supplying a raw water within the pre-processing filter tank to the cold water softening part in the cold water softening mode, discharging the raw water to the outside in the water direct discharging mode, and supplying the raw water to the regenerating tank and then supplying the regenerating water discharged from the regenerating water outlet to the cold water softening part in the regenerating mode;

a second switching valve being supplied with the raw water within the pre-processing filter tank from the first switching valve and then supplying the raw water to any one region selected from the at least two regions of the hot water softening part in the hot water softening mode, and being supplied with regenerating water from a first switching valve ~~V4~~ and then supplying the regenerating water to at least one region selected from the at least two regions of the hot water softening part in the regeneration mode; and

a control part, controlling operations of the first and second switching valves based on the result sensed by the flow meter and the temperature sensor to control each of the modes,

wherein the cold/hot water softener supplies hot raw water having different temperature to the at least two regions, thereby discharging hot soft water having subdivided temperature, and prosecutes the regeneration mode based on the inflow amount of the raw water.

13. (Previously amended) A cold/hot water softener according to claim 12, wherein, the regenerating water discharging hole is positioned at a center of a bottom surface of the regenerating tank, an inside of the regenerating tank being partitioned by a regenerating tank partition installed along the direction of length and forming first to fourth sections arranged in a shape of a concentric circle, the regenerating tank partition being formed with embayment portions at a center of an upper end thereof and at a center of a lower end thereof, respectively, which is communicated to each other,

so that all of the first to fourth sections are communicated with the regenerating water discharging hole.

14. (Currently amended) A cold/hot water softener according to claim 12, wherein, each of the pre-processing filter tanks, the water softening tank and the regenerating tank having an opened upper side, the water softener further comprising:

a base plate covering upper sides of the pre-processing filter tank, the water softening tank and the regenerating tank, while securing a first switching valve region, having a water direct discharging hole and a regenerating water supply hole connected to the regenerating water discharging hole, the base plate having a filter inlet in communication with the pre-processing filter tank, a cold raw water discharging holes in communication with the cold water softening part, first to fourth hot raw water discharging holes in communication with the first to fourth regions sections, respectively, a regenerating tank inlet hole in communication with the regenerating tank, and a regenerating raw water hole;

a lead plate having a filter tank inlet extending the filter inlet hole and a regenerating tank inlet extending the regenerating tank inlet hole, the lead plate being stacked on the base plate while having a ball shaped first switching valve housing which is formed with a cold raw water hole, a cold regenerating water hole, a hot raw water hole, a hot regenerating water hole, a regenerating raw water hole, a direct water hole communicated with the direct water discharging hole, and a regenerating water hole communicated with the regenerating water supply hole, on a bottom surface thereof corresponding to the first switching valve region, the lead plate having first to fourth hot raw water discharging holes in communication with the first to fourth hot raw water discharging holes, respectively, while securing a second switching valve region having a hot raw water supply hole

which is passed through toward a part corresponded to the regenerating tank;

a raw water supply passage arranged between the base plate and the lead plate for connecting the filter tank inlet with a side surface of the first switching valve housing, a cold raw water passage connecting the cold raw water discharging hole with the cold raw water hole and the cold regenerating water hole, a hot raw water passage for connecting the hot raw water supply hole with the hot raw water hole and the hot regenerating water hole, and a regenerating raw water passage connecting the regenerating raw water hole with the regenerating raw water discharging hole;

a first switching valve unit mounted within the first switching valve housing;

a valve passage cover having first to fourth distribution passage pipes formed with first to fourth hot raw water distribution passages having a groove shape at a bottom surface thereof to be connected with the first to fourth distribution holes and the first to fourth hot water discharging holes, respectively, which are branched off from a side surface of a ball shaped second switching valve housing having a hot raw water supply hole communicated with the hot raw water supply hole; and

a second switching valve unit mounted within the second switching valve housing.